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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/695,307	10/28/2003	Seetharaman Sridhar	TI-36658 (032350.B546)	4176
23494	7590	05/18/2005	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			GUERRERO, MARIA F	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 05/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/695,307

Applicant(s)

SRIDHAR ET AL.

Examiner

Maria Guerrero

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 17-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. This Office Action is in response to the Election filed March 31, 2005.

#### **Status of Claims**

2. Claims 1-20 are pending.

#### ***Election/Restrictions***

3. Applicant's election without traverse of Group I (claims 1-16) in the reply filed on March 31, 2005 is acknowledged.

Claims 17-20 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on March 31, 2005.

#### ***Information Disclosure Statement***

4. The information disclosure statement filed October 28, 2004 has been considered.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 6-7 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Rodder et al. (US 6,124,627).

Rodder et al. shows providing a substrate having a source region, a gate region, and a drain region (Abstract). Rodder et al. discloses forming a silicon-germanium layer (106a) in each source and drain regions by epitaxy process (Abstract, Fig. 2, col. 2, lines 48-55, col. 4, lines 23-30). Rodder et al. teaches forming a silicon (106b) layer outwardly from the silicon- germanium layer (106a) in each of the source and drain regions (Abstract, Fig. 2). Rodder et al. describes forming a silicide layer in each of the source and drain regions (col. 4, lines 58-65; col. 6, lines 24-40).

6. Claims 1-3, 6-7 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Mizushima et al. (US 6,713,359).

7. Mizushima et al. shows providing a substrate having a source region, a gate region, and a drain region. Mizushima et al. discloses forming a silicon-germanium layer (18) in each of the source and drain regions. Mizushima et al. teaches forming a silicon (19) layer outwardly from the silicon- germanium layer (18) in each of the source and drain regions. Mizushima et al. describes forming a silicide layer (20) in each of the source and drain regions. Mizushima et al. shows depositing a reactive metal (cobalt) outwardly from the silicon layer in each of the source and drain regions, reacting the metal with at least the silicon layer and selectively removing the non-reacted metal from the substrate (col. 6, lines 55-67, col. 7, lines 1-4). Mizushima et al. discloses the silicon- germanium layer (18) having a thickness between 100 angstroms and 1000

angstroms and specifically within the range of between 300 angstroms and 500 angstroms (col. 6, lines 34-42).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8-9, 12-13 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizushima et al. (US 6,713,359).

8. Mizushima et al. shows providing a substrate having a source region, a gate region, and a drain region. Mizushima et al. discloses forming a silicon-germanium layer (18) in each of the source and drain regions. Mizushima et al. teaches forming a silicon (19) layer outwardly from the silicon- germanium layer (18) in each of the source and drain regions. Mizushima et al. describes forming a silicide layer (20) in each of the source and drain regions. Mizushima et al. shows depositing a reactive metal (cobalt) outwardly from the silicon layer in each of the source and drain regions, reacting the metal with at least the silicon layer and selectively removing the non-reacted metal from the substrate (col. 6, lines 55-67, col. 7, lines 1-4). Mizushima et al. discloses the silicon- germanium layer (18) having a thickness between 100 angstroms and 1000

angstroms and specifically within the range of between 300 angstroms and 500 angstroms (col. 6, lines 34-42).

9. Mizushima et al. is silent about the thickness of the silicon layer being between approximately 25 angstroms and 150 angstroms. However, Mizushima et al. suggested that the thickness not being larger than 200 angstroms (col. 6, lines 52-55).

10. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to include the claimed thickness by routine experimentation because there is not evidence of criticality. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). See MPEP § 716.02 - § 716.02(g) for a discussion of criticality and unexpected results.

11. Claims 4-5, 8-10, 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rodder et al. (US 6,124,627) in view of Imai (US 5,872,039).

Rodder et al. shows providing a substrate having a source region, a gate region, and a drain region (Abstract). Rodder et al. discloses forming a silicon-germanium layer (106a) in each source and drain regions by epitaxy process (Abstract, Fig. 2, col. 2, lines 48-55, col. 4, lines 23-30). Rodder et al. teaches forming a silicon (106b) layer outwardly from the silicon- germanium layer (106a) in each of the source and drain regions (Abstract, Fig. 2). Rodder et al. describes forming a low resistance material over

the source and drain regions by salicidation of the portion of the source/drain regions 106 (col. 4, lines 58-65; col. 6, lines 24-40, col. 7, lines 24-40).

Rodder is silent about the thickness of the silicon-germanium layer and the silicon layer. Rodder does not specifically show the metal employed in the silicidation process. However, Imai discloses forming a titanium silicide layer by first forming an epitaxial layer (5) having a thickness of 300 angstroms and forming a second epitaxial layer (6) over the epitaxial layer (5) having a thickness of  $\frac{1}{2}$  (150 angstroms) to  $\frac{1}{4}$  (75 angstroms) of the thickness of the epitaxial layer (5) (col. 5, lines 45-57, col. 6, lines 20-25).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Rodder reference by specify the use of the well known titanium and the thickness taught by Imai in order to ensure lateral scaling of the device while avoiding substrate consumption.

### ***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lee (US 6,406,973), Moslehi (US 5,168,072), Ozturk et al. (US 5,242,847) and Muthy et al. (US 6,214,679) show the use of silicon-germanium during a silicidation process as well known in the art.


13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

May 13, 2005

  
**MARIA F. GUERRERO**  
**PRIMARY EXAMINER**